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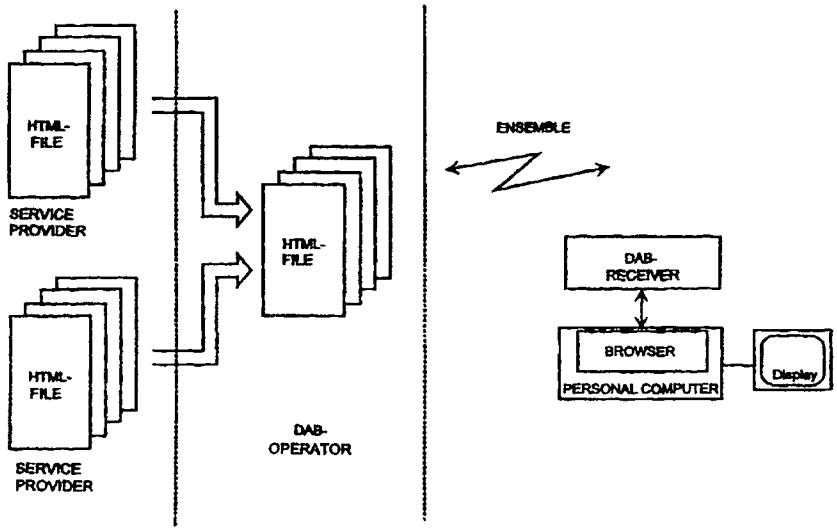

(57) Abstract

According to the invention, a special programme guide file is generated at the transmitting end of a DAB system. It is a plain-language file which could contain text and pictures. Each service provider can create a separate programme guide file. The system operator forms them into a single file to be transmitted. The file contains text and pictures visible to the user and a large amount of information intended for the application software of the receiver, invisible to the user. This information may be hidden text, instructions, algorithms. The most important data invisible to the user is a link which, upon activation by the user, links the file to another file. Thus, by activating links, the user is able to navigate in the programme guide and to quickly find and collect the information he/she is interested in, whereupon the receiver automatically composes the requested service from the subschannels of the DAB multiplex.

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Handling of program files in a digital broadcasting system

The present invention relates to the handling of information relating to service programmes in a digital broadcasting system which allows the transmission of audio and data services as well as selective reception of such services. The information to be transmitted over the transmission channel may be either a continuous audio or data stream or packet format information.

In the Digital Audio Broadcasting (DAB) system, which has been developed to allow an efficient utilization of frequency bands, the transmission path is completely digital, and the system is designed to replace the analogue broadcasting system commonly used at present, which is based on the use of frequency modulation. DAB has been designed especially for a mobile environment, in other words, the receiver may be moving, but still the various decay effects and disturbances occurring in the propagation of the radio signal are avoided via suitable modulation and channel encoding.

DAB defines a digital radio channel based on multiple carriers, which is applicable for the transmission of both audio and data services. A completely digital transmission channel may be either a continuous data stream channel or a packet channel. The DAB system is presented in detail in ETSI (European Telecommunication Standards Institute) standard 300 401, February, 1995.

From the user's point of view, the highest level of abstraction in the DAB system is called ensemble, Fig. 1. It contains all services existing in a given frequency band. A change from one ensemble to another is effected by tuning to a different frequency band, just as one changes channels in current FM radio reception. The ensemble is divided into services, exemplified in Fig. 1 by Alpha Radio 1, Beta Radio and Alpha Radio 2. In addition, there may be data services, although they are not shown in the figure. Each service is further divided into service components. Each service component is either an audio channel or a data channel. For comparison, let it be stated that FM radio contains only one service and one service component (audio) in each channel. At the lowest level, the transmission frame, whose duration is exactly 24 ms or 96 ms depending on the mode, consists of three chronologically consecutive parts. The first part is a Synchronizing Channel, which contains no service information. The next part is a Fast Information Channel FIC, which has a mode-specific

fixed length. The last part is a Main Service Channel MSC, which contains all the subchannels. The position, size and number of subchannels within the MSC can vary, but still the size of the MSC is constant. The MSC contains a maximum of 63 different audio and/or data subchannels. The subchannels are numbered on the basis of a so-called Channel Id from 0 to 62. Moreover, the MSC may contain an Auxiliary Information Channel AIC, which has a fixed channel number 63. The AIC may contain the same type of information as the FIC.

In Fig. 2, which presents a simplified DAB system, a transmitter control device 1 controls the transmission. The FIC and control block 2 produces general service information SI relating to audio and data services, which helps the user select the service he/she wants, multiplex configuration information MCI, i.e. data indicating the number, size and location of subchannels, and conditional access information CA, which may relate to the chargeability of services or to encryption. These together, and possibly a fast information data channel FIDC, form a fast information channel FIC. The audio information, e.g. music, provided by audio service providers is compressed by an MPEG audio encoder 4 and passed to audio channel encoders 5. Correspondingly, the data supplied by data service sources 6 is encoded by a data channel encoder 7. The data can be transmitted as a continuous stream or in the form of packets with addresses, so one subchannel may contain several packet channels.

The channel-encoded and time-interlaced data and audio information as well as FIC information is passed into block 8, where different channels are first multiplexed into a common frame. After this, the frame is divided into blocks and, for each channel, successive OFDM symbols of a given duration are formed from the bits and these symbols are modulated by the D-QPSK (Differential Quaternary Phase Shift Keying) method. Next, an inverse Fourier transformation is performed, giving a time-level I/Q signal, which is used in the modulation of a radio frequency carrier. Each transmission frame is thus time-multiplexed between the synchronizing channel, fast information channel FIC and the main service channel MSC containing the audio and data services. In DAB mode III, which is intended for aerial, satellite and cable transmissions, there are 192 carriers, a frame has 153 symbols and the duration of a frame is 24 ms.

At the receiving end, the DAB ensemble received is multiplexed in a COFDM (Coded Orthogonal Frequency Division Multiplex) block 9, which converts the I-Q signal into digital form. The digitalized signal is transferred to the frequency level via a fast Fourier transformation, the frequency interlacing is removed and transmission frames are formed from successive OFDM symbols. Thus the transmission frame is as presented in the lower part of Fig. 1. The information channel FIC and the MSC containing the audio and data services are separated from each other, and subchannels are separated from the MSC channel and channel-decoded by decoders 5' and 6'. The desired subchannels are then passed on for further processing. From the FIC channel, the user can get information about the services contained in the ensemble received and is thus able to select the desired service/services.

Fig. 3 represents a receiver suited for media applications. As described above, the ensemble received is divided into a number of services and each service is further divided into service components. A service component is either an audio channel or a data channel. The ensemble is decoded in a COFDM (Coded Orthogonal Frequency Division Multiplex) block 31 and, via demultiplexing, subchannels SUBCH1,...,SUBCHL as well as the components SI, MCI and FIDC of the fast information channel FIC are separated from the MSC channel. The maximum number of subchannels is 64. The desired subchannels are then passed on for further processing. A desired packet channel can thus be separated from a data channel on the basis of the packet address and passed into the receiver. By combining subchannel service components, such as audio/speech, continuous video and packet data in accordance with the application software, multimedia services, a hypermedia service, a file-based service and hypertext are achieved. The services thus formed are then passed on to the user's display device or for further processing. The interface A is an interface to the service components, from which the desired services are formed by user agents.

In practice, a DAB receiver comprises a block (SI handler) for handling service information, a block (FIC handler) for handling the FIC information channel, and an application software block, which is informed about the positions of the subchannels in the multiplex by the information channel handling block FICH. The SI handler, to which are connected both the service information channel SI and the auxiliary information channel AIC, produces for the application software block more detailed

information describing the services, while the latter block generates e.g. a graphic user interface. The user interface may contain e.g. a text which reads "this ensemble (name) contains the services ALPHA RADIO 1, BETA RADIO, ALPHA RADIO 2", followed by a prompt "Select service". The user then selects a desired service using a keyboard, a mouse or some other suitable means, whereupon a list of programmes available in this service, possibly together with a short description of each programme, is displayed. The description may inform the user that he/she can choose e.g. to display pictures associated with music or the lyrics of songs. The user then makes several selections to get a programme of the kind and composition he/she wants. In response to the user's selections, the application software block commissions the FIC handler to pick out the requested channels to compose the programme.

A problem in this type of selection is that the application software block must operate by observing the service hierarchy and rely on the rather scanty information that is available from the prior-art service information channel SI and auxiliary information channel AIC. For this reason, selecting the service components needed to compose a desired programme requires numerous operations by the user. Searching the supply of programmes takes time, because the user must now and again return to the ensemble level or service level and then proceed down the hierarchy, making selections. In the prior-art system, the only information given to the user via the FIC channel is a service name presented with a 16-character "service label". The names are transmitted as a 6-bit encoded binary number.

To provide a general solution to this problem, it has been proposed that use be made of the rather high data transmission capacity of the system by sending to the receiver a special "electronic programme guide". This would be e.g. a text file giving plain information about the various services available. No details have been suggested as to what the format of the file would be and in which channel it would be transmitted. It could be fashioned after the style of the radio and television programmes page currently published in newspapers.

The object of the present invention is to achieve a guidance arrangement to make it easier for the user to make selections between the numerous programmes comprised in a DAB ensemble. The guidance should have a graphic implementation as seen by the user, and it should be easy to use, informative and interactive. As to its

internal structure, the guidance should be so designed that the user is able to start a desired programme directly from the guidance.

Another object is to achieve an arrangement that, in addition to the transmission of an electronic programme guide, is also applicable for the transmission of any file of the same type as the programme guide. An example of such use is an interactive multimedia type instruction program.

These objects are achieved with a system as described in claim 1 and a receiver as described in claim 6.

According to the invention, a special file is generated and transmitted at the transmission end of the DAB system. It is a plain-language file which could contain pictures and text. Each provider of services can create a separate file. The operator either collects the different files, combines them and forms them into a single file to be transmitted, or preferably the operator generates a separate file which contains links to the files of the service providers. According to the basic idea of the invention, the file contains text and pictures visible to the user and a large amount of information intended for the application software of the receiver, not visible to the user. This information may be hidden text, instructions, algorithms. The most important data invisible to the user is a link which, upon activation by the user, links the file to another file. Thus, by activating links, the user is able to navigate between files and to quickly find and collect the information he/she is interested in, whereupon the receiver automatically composes the requested service from the subchannels of the DAB multiplex. This method provides a special advantage in the creation of an electronic programme guide.

According to a particularly advantageous embodiment, the file consists of HTML image pages. The image pages can be transmitted in one channel or they can be divided among several channels.

In the following, the invention is described in greater detail by referring to the attached figures, of which

Fig. 1 represents the hierarchy levels in the DAB system,

Fig. 2 represents an entire DAB system in a simplified form,

Fig. 3 represents the operations performed in the receiver, and

Fig. 4 is a diagram representing the basic idea of the invention.

For the user to get a maximum benefit from the invention, let us assume that he/she has a large enough display device to display a sufficient amount of information at a time. This requirement can be met by connecting the DAB receiver to a computer.

According to the invention, each service provider generates a separate service guide, using the same uniform format. In a specially preferred case, the format is the HTML (Hypertext Mark-up Language) known in itself, which is a simple data format designed for the generation of hypertext documents and documents intended to be transferred from an apparatus to another.

To make the invention easier to understand, the content of the concept of HTML is now briefly explained. HTML documents are SGML documents and their general semantics enables the presentation of different types of information. The service provider's source material, which may consist of text, pictures or combinations of text and pictures or structured documents containing graphics, is converted into an HTML document, using the HTML language. The document is transmitted over a transmission network to the receiver's computer, whose software (agent) converts the received document so as to enable it to be displayed in a format defined in the document. SGML is defined in ISO standard 8879:1986, Information Processing Text and Office Systems Standard Generalized Mark-up Language (SMGL). A known area of use is the WWW (World Wide Web), which is a decentralized, hypertext-based information system developed by CERN. Its use is particularly well known in connection with the Internet.

The term HTML is generally used to denote both document type and events in the document. "Events" means element changes in the document, such as e.g. the beginning and end of a title, the beginning and end of a paragraph, images, hyperlinks, etc. "Mark-ups" are syntactic separators added to the document data to describe its structure. The commonest mark-up is called tag, which is used to separate elements. There is e.g. a start tag, which is the character <, and an end tag, which is the sign </. Tags can also be used to give instructions to the software in the receiver; for instance, the element <TITLE> indicates that the text following it is a title, which again is terminated by the element </TITLE>. From the point of view of the present invention, an important element is the anchor <A>. It defines a hyperlink, which is the relationship

between two anchors. The anchors can be placed in the same document or in different documents. It is this feature that enables net surfing, well known to Internet users. For the user to be able to move from an anchor over a link to another anchor, it is necessary to define a URI (Uniform Resource Identifier), which is used for unambiguous identification of hyperlinks. In practice, the URI is composed of a URL (Uniform Resource Locator) and a relative URL. The link can point to the head anchor either directly using a URI or indirectly using a URL.

Referring now to Fig. 4, each provider of DAB services creates an HTML-format guide file relating to their service, containing one or more pages. The file may comprise text and images. One page may contain a general description of the service, another a more detailed presentation of the programme of the day together with times of transmission, while the other pages may contain a weekly programme. Some pages may contain the lyrics of the music to be presented. In addition, there may be graphics files with still pictures. A page may contain several links, which point to certain parts on the other pages of the same file or to a graphics file. In other words, a link is associated with a head address URL.

The DAB operator, who can also be called the producer of the multiplex, collects the HTML programme files of different service providers and possibly adds hyperlinks to them. Moreover, the operator generates a separate file which describes the various ensembles available and lists their services. To this file are also added hyperlinks to the files of the serviceproviders. To a page in the service provider's programme file containing an overview of the services, it is possible to add hyperlinks enabling the pages to be linked to the pages of other service providers or to the pages for other services of the same provider (horizontal linking within the DAB hierarchy), as well as hyperlinks enabling the pages to be linked to the ensemble (vertical linking within the DAB hierarchy). In this way, the DAB operator generates a combined programme guide containing several HTML file pages.

A passage from a service provider's programme guide could look e.g. like this:

***Alpha radio**: This service mainly consists of music with occasional news. The programmes today are as follows.*

8:00 - 9:00 Light music to start the working day. This is a multimedia programme. You may view the programme with all the ***multimedia features by clicking here,*** *or you may choose to just listen to the programme* ***with lyrics*** *or* ***without lyrics.***

9:00 - 9:10 News.

.

.

If you want to preview the Alpha Radio programmes for tomorrow, click ***here.***

In the above passage, the parts shown in bold text are hyperlinks. In a corresponding position in the HTML language, there is a tag <A>. When the user clicks on one of the bold parts, the application software finds the address of the anchor at the other end of the link and performs a jump to the file and position indicated by it, whereupon the new page is displayed. Thus, if the user wishes to preview the programme for tomorrow, he/she will click with the mouse on the last bolded word in the above passage, whereupon the application software will find the programme page for the day in question. Each service provider can freely make their own pages and add hyperlinks to them, so it is possible to give the user as detailed information about the programmes as desired.

The bold text ***Alpha Radio*** can be a link to the service list of the ensemble, which again may contain a link to a list of other ensembles. In the former case, by clicking on a desired service, the user will see the channels available within that service.

After the DAB operator has generated his own pages and combined the service providerliers' program pages, the combined programme guide thus composed from successive HTML files has to be placed in the multiplex. At least a part of it, preferably the startup page, is placed in the AIC channel (Auxiliary Information Channel), which has a fixed channel number 63. The rest of the files can be placed either in the AIC channel or in one of the packet channels.

In the receiver, the application software, which can be placed in a PC, forms HTML pages from the files received and generates a graphic user interface defined by them, in which the hyperlinks are visible. By means of the hyperlinks, the user can select a desired service. After the user has activated a hyperlink, the application software block performs a search based on the address of the hyperlink anchor and dis-

plays the file containing the anchor. Files are loaded and started immediately in response to the user's actions.

The things described above do not require any big changes in the DAB system. What is needed is mechanisms for creating HTML files at the transmitting end and for their handling at the receiving end. Such mechanisms are familiar to the person skilled in the art, e.g. from the Internet. In addition, mechanisms for transmitting groups of files in a packet channel so as to enable the receiver to assemble the correct files in correct order are needed. Furthermore, a mechanism is needed that enables the receiver to identify a startup file, in this case the first page of a programme file. Such mechanisms related to the transmission of files are described in patent application FI-954752, filed by the applicant simultaneously with the present application.

In addition to the file transfer described in the aforementioned patent application, the only thing that requires more accurate definition is a mechanism for referring to the resources, i.e. programs, files, etc. in the DAB ensemble. This means that the meaning of the URLs (Uniform Resource Locators) in hyperlink anchors has to be defined. Below are descriptions of some embodiments relating to the audio service, packet mode, the fast information data channel FIDC contained in the FIC channel and finally the auxiliary information channel AIC.

For the audio channel, the following type of URL is proposed:
dab://ensemble_id/service_id:16/subch_id:A, where *ensemble_id* is an ensemble identifier consisting of a number in the decimal system, *service_id* is a service identifier in the decimal system, *:16* means that a 16-bit service identifier is used, *subch_id* is the identifier of a subchannel of the service component and *:A* means that the service component is a continuous audio stream. When this string is presented to the receiver, audio reception is started immediately. It should be noted that all the service_ids and symbol_ids in this string are completely invisible to the user.

If only an audio file of a certain length (music for a given length of time) is to be separated from this audio stream, the fields /start_frame:length are appended to the end of the URL shown above, in which case the frames form a file and the URL will be as follows:
dab://ensemble_id/service_id:16/subch_id:A/start_frame:length, where *start_frame* is a starting frame from which the counting is started and *length* = the length of the

audio files as logical frames in the decimal system. When this string is presented to the receiver, the latter will extract the requested frames and save them in a file in memory.

If an XPAD application is to be started, the following anchor is used: *dab://ensemble_id/service_id:16/subch_id:application_type*, where *application_type* is the number of the application type in the decimal system.

The number following the subchannel identifier indicates that the TMID of the service component refers to continuous audio. If the user wants to start both the XPAD application and the audio service simultaneously, the following string can be used:

dab://ensemble_id/service_id:16/subch_id:A/application_type.

To receive a file from the XPAD, it is possible to use either the string

dab://ensemble_id/service_id:16/subch_id:P/filenme:N

or the string

dab://ensemble_id/service_id:16/subch_id:P/file_id:1

In these strings, the character P refers to an audio channel XPAD. PAD (Program Associated Data) refers to a data section added to the end of the audio frame according to the specification. In the data section it is possible to transmit e.g. the lyrics for music. Such space is produced when the audio frame is compressed. XPAD means a so-called extra PAD. *Filename* is the name of the XPAD file and may include an extension. The character *N* means that the filename is referred to, */file_id* is a file identifier in the decimal system and the character *1* means that the file is referred to using its identifier.

In the foregoing, it is assumed that a file transfer protocol is defined in the PAD and that the application type transmitting the protocol is implicitly known.

Next, possible URL strings to be presented to the receiver when a link refers to a packet channel are described.

dab://*ensemble_id/service_id:16/scid:D/subserv:s/filename:N*

dab://*ensemble_id/service_id:32/scid:D/subserv:s/file_id:1*

where *scid* is a service component identifier in the decimal system, :D indicates that the reference relates to a service component identifier, *subserv* is the path of the identifier as a decade, :S indicates that the path identifier is referred to. Placing a

/subserv:S field in the URL is optional. The string :12 indicates that a 32-bit service identifier is used.

To refer to the FIC data channel FIDC, it is possible to use the URL type dab:*//ensemble_id/service_id:16/fidc_id:F*, where *fidc_id* is a FIDC channel identifier in the decimal system and :F means that the FIDC channel identifier is referred to.

The auxiliary information channel AIC differs from other packet channels in that the information in this channel is only produced by the operator, not by a service provider. Therefore, the following URL contains no service identifier:

dab:*//ensemble_id:A/subserv:S/filename:N*

dab:*//ensemble_id:A/subserv:S/file_id:I*

The designation *:A* refers to subchannel 63 and to the packet address 1023 of the AIC channel. The directory path *subserv:S* is optional.

In the passage from a service provider's programme guide given at the beginning of the specific part of the present application, the hyperlink **Alpha Radio** is mentioned. When presented in HTML format invisible to the user, this link would have the form:

<A HREF="dab://5/12:16/5:D/4:S/alpharad.jpg:N">Alpha Radio</A>. The URL refers to a packet channel, in which there is a JPEG image with the filename 'alpharadjpg'. The ensemble identifier is 5 and the 16-bit service identifier is 12. The service component identifier is 5 (in the case of this example, this component contains JPEG images). The subservice identifier (directory path identifier) is 4. It is not necessary to specify for the receiver that the image is a JPEG image only because the extension is jpg. This information is also contained in the file type parameter in the IDG.

The next hyperlink in the aforesaid passage is *multimedia features by clicking here,* which in HTML format would look like this:

<A HREF="dab://5/12:16/7:D/startup.mhg:N">multimedia features by clicking here</A>

This URL refers to an MHEG file whose filename in the packet channel is startup.mhg. When this file is loaded, the MHEG program takes charge of the multimedia presentation. The file type parameter in the information data group IDG indicates that this is a multimedia startup file in MHEG format. Based on this information, the receiver is able to transfer control to the MHEG software.

The next hyperlink in the passage is **with lyrics**. In HTML format this is <A HREF="dab://5/12:16/23:A4">with lyrics</A>. Here the URL refers to the audio stream in subchannel 23. Application type 4, which is an ITTS text, is started besides the audio stream. The next hyperlink in the passage is **without lyrics**. In HTML format this is <A HREF="dab://5/12:16/23:A4">without lyrics</A>. The last hyperlink in the passage is **here**, and in HTML format this would be <A HREF="dab://5:A/alphara2.htm">here</A>. The anchor URL refers to a HTML file with the filename alphara2.htm. The file is to be found in the AIC channel.

The above description and the associated figures are only intended to illustrate the invention. Different variations and modifications of the invention will be obvious to persons skilled in the art, without departing from the sphere of protection and spirit of the invention presented in the following claims.

Claims

1. Digital broadcasting system, in which a transmission frame formed via orthogonal frequency multiplexing OFDM comprises in time-multiplexed form:

a fast information channel containing general information relating to audio and data services, the number of subchannels, multiplex configuration information indicating size and location and a fast information data channel,

a channel composed of several subchannels and transmitting audio and data services, in which one subchannel is an auxiliary channel intended for information, **characterized** in that

a hypertext type program combined from a plurality of separate plain-language files is transmitted in transmission frames, the files of said program containing data invisible to the user and capable of being activated by the user.

2. System as defined in claim 1, **characterized** in that the program is an electronic programme guide for an ensemble.

3. System as defined in claim 2, **characterized** in that the separate plain-language files are hypertext type programme guides created by each service provider and containing text and images relating to the provider's service, and that the system operator adds his own files.

4. System as defined in claim 1, **characterized** in that the program is transmitted via a fast information data channel (AIC).

5. System as defined in claim 1, **characterized** in that a part of the program is transmitted over the fast information data channel (AIC) and the rest over a subchannel transmitting the service provider's packet data.

6. System as defined in claim 1, **characterized** in that the separate plain-language file is a HTML (Hypertext Mark-up Language) type file, which may comprise several pages containing links.

7. Receiver for a digital broadcasting system, in which general information (SI) relating to audio and data services, the number of subchannels, multiplex configuration information (MCI) indicating size and location and a fast information data channel (FIDC) are separated from the fast information channel (FIC) of a transmission frame received and subchannels are separated from the channel transmitting

audio and data services, one of said subchannels being an auxiliary channel (AIC) intended for information,

characterized in that

the receiver contains means for separating and displaying on a display device a program transmitted in least one of the channels in the transmission frame, which program has been combined from a plurality of separate plain-language files which additionally contain data invisible to the user and capable of being activated by the user,

based on the information visible on the display device, the user selects a desired service by activating invisible data on the basis of which said means produce a prompt, in response to which the receiver automatically separates the subchannels containing the service components of the selected service to implement the service.

8. Receiver as defined in claim 7, **characterized** in that the program files handled by the receiver are HTML (Hypertext Mark-up Language) type files.

9. Receiver as defined in claim 7, **characterized** in that the service-specific programmes of each service provider are displayed on the display device as separate pages.

10. Receiver as defined in claim 7, **characterized** in that it separates at least part of the program from a subchannel which is an auxiliary channel (AIC) intended for information.

11. Receiver as defined in claim 7, **characterized** in that the program is an electronic programme guide for audio and data services in an ensemble.

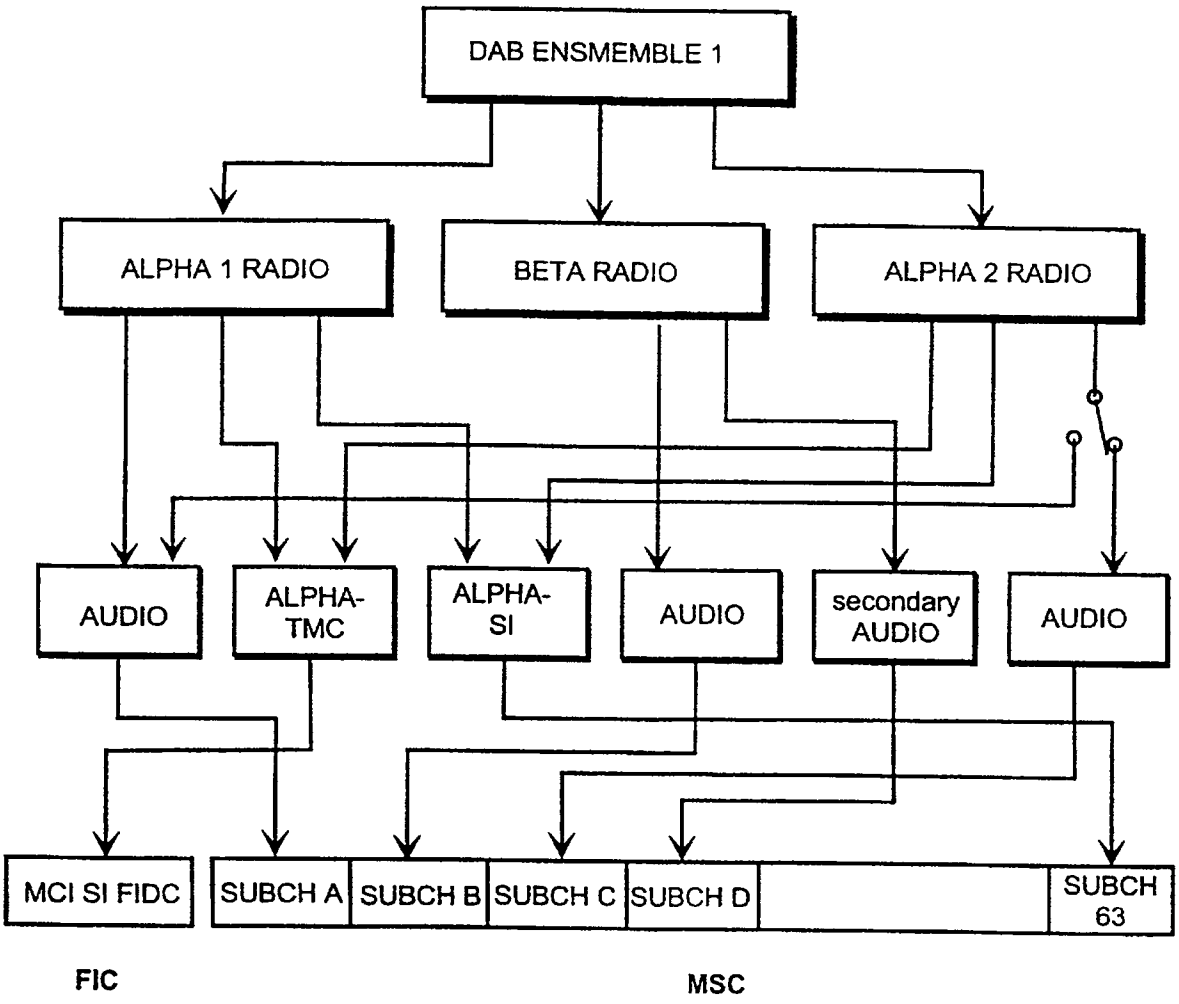
DAB ENSMEMBLE 1
ALPHA 1 RADIO
BETA RADIO
ALPHA 2 RADIO
AUDIO
ALPHA-TMC
ALPHA-SI
AUDIO
secondary AUDIO
AUDIO
MCI SI FIDC
SUBCH A
SUBCH B
SUBCH C
SUBCH D
SUBCH 63
FIC
MSC

Fig. 1

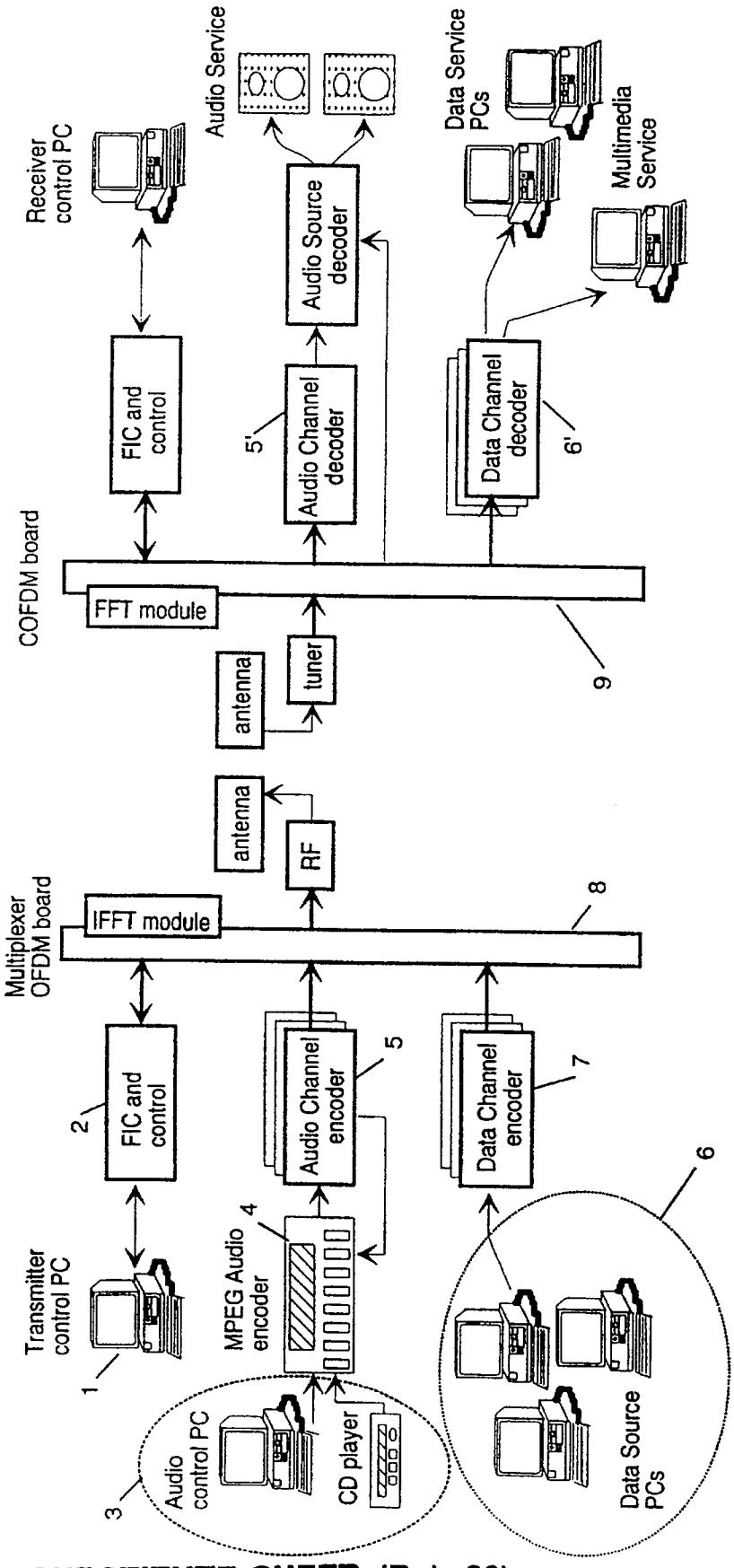
Receiver control PC
Audio Service
Data Service PCs
Multimedia Service
Audio Source decoder
FIC and control
5'
Audio Channel decoder
Data Channel decoder
6'
COFDM board
FFT module
antenna
tuner
9
antenna
RF
Multiplexer OFDM board
IFFT module
8
2
FIC and control
Audio Channel encoder
5
Data Channel encoder
7
6
Transmitter control PC
MPEG Audio encoder
4
1
3
Audio control PC
CD player
Data Source PCs

Fig. 2

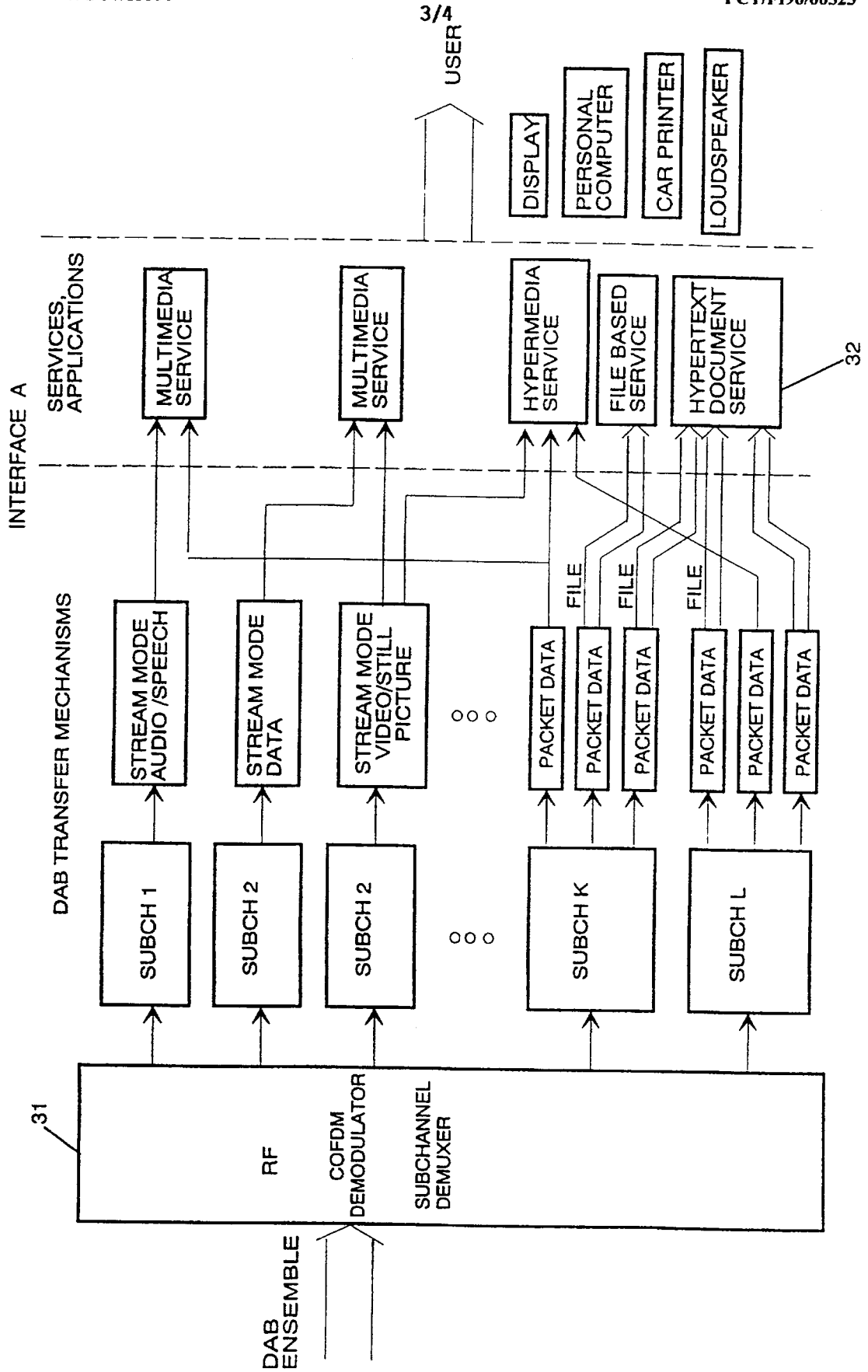
USER
DISPLAY
PERSONAL COMPUTER
CAR PRINTER
LOUDSPEAKER
INTERFACE A
SERVICES, APPLICATIONS
MULTIMEDIA SERVICE
MULTIMEDIA SERVICE
HYPERMEDIA SERVICE
FILE BASED SERVICE
HYPERTEXT DOCUMENT SERVICE
32
DAB TRANSFER MECHANISMS
STREAM MODE AUDIO /SPEECH
STREAM MODE DATA
STREAM MODE VIDEO/STILL PICTURE
FILE
FILE
FILE
PACKET DATA
PACKET DATA
PACKET DATA
PACKET DATA
PACKET DATA
PACKET DATA
SUBCH 1
SUBCH 2
SUBCH 2
SUBCH K
SUBCH L
31
RF
COFDM DEMODULATOR
SUBCHANNEL DEMUXER
DAB ENSEMBLE

Fig. 3

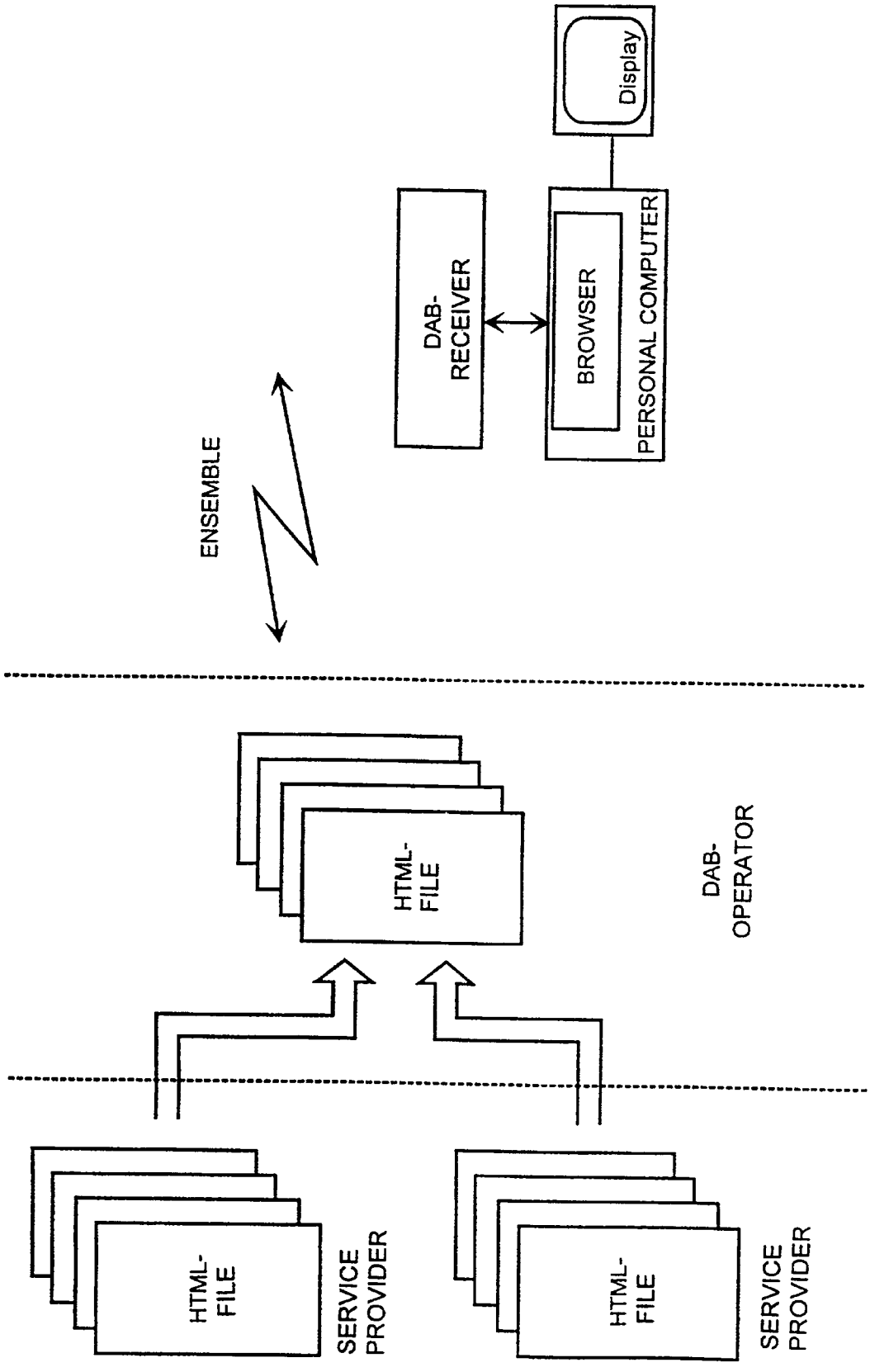
Display
DAB-
RECEIVER
BROWSER
PERSONAL COMPUTER
ENSEMBLE
HTML-
FILE
DAB-
OPERATOR
HTML-
FILE
SERVICE
PROVIDER
HTML-
FILE
SERVICE
PROVIDER

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 96/00523

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04H 1/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04H, H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	FUNKSCHAU, No. 22/95, 13 October 1995, pages 45-48 (INGRID MITTERHUMMR ET AL), "Datenrundfunk mit DAB" --	1-11
Y	WO 9414283 A1 (DISCOVERY COMMUNICATIONS, INC.), 23 June 1994 (23.06.94), claims 1-6, 8-12, 14, 19-22, 25, 26 --	1-5,7,9-11
Y	DE 4422015 C1 (ROBERT BOSCH GMBH), 3 August 1995 (03.08.95) --	1-5,7,9-11
A,P	EP 0723369 A1 (NTEX DATACOMMUNICATIONS BV), 24 July 1996 (24.07.96) --	6,8

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
27 February 1997

Date of mailing of the international search report
03 -03- 1997

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INTERNATIONAL SEARCH REPORT

Information on patent family members

03/02/97

International application No.
PCT/FI 96/00523

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		AU-A- 5733294	04/07/94
		AU-A- 5736394	04/07/94
		AU-A- 5845894	22/06/94
		AU-A- 5869894	04/07/94
		CA-A- 2151458	23/06/94
		CN-A- 1090451	03/08/94
		CN-A- 1090452	03/08/94
		CN-A- 1090453	03/08/94
		CN-A- 1090454	03/08/94
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		CN-A- 1096151	07/12/94
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		EP-A- 0673579	27/09/95
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		EP-A- 0673581	27/09/95
		EP-A- 0673582	27/09/95
		EP-A- 0673583	27/09/95
		EP-A- 0674824	04/10/95
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		JP-T- 8506941	23/07/96
		JP-T- 8506942	23/07/96
		JP-T- 8510869	12/11/96
		NZ-A- 259148	26/11/96
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		WO-A- 9414280	23/06/94
		WO-A- 9414281	23/06/94
		WO-A- 9414282	23/06/94
		WO-A- 9414284	23/06/94
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		WO-A- 9534965	21/12/95
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